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(54) ADJUSTABLE SLICING APPARATUS

(71) We, ITT INDUSTRIES INC., a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 320 Park Avenue, New York 22, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a slicing apparatus, and more particularly to an adjustable slicing apparatus for slicing slabs of a food product, for example, bacon so that compensation may be made for dimensional variations in the thickness of a slab.

One of the major problems in the meat packing industry is to maximize the return per ounce on animal carcasses, and of particular concern is the slicing and scaling of bacon slabs. Always in the background of such considerations, is the object of producing a slice of bacon for a consumer package which is attractive and uniform, regardless of the original dimensions of the slab of bacon. In slicing bacon, the dimensions of the slab, such as height, may vary considerably, the height (thickness of the slab) may vary anywhere from 3/4 to 2-1/2 inches. From the standpoint of percentage deviation, variations in the width of the slabs are considerably less appreciable, and grading of a slab with grade A toward the higher thickness of slab, and grade B toward the lower thickness of the slab accounts for the primary grading considerations.

As can be imagined, grade B bacon has a considerably lower market value than grade A bacon, primarily due to the variation in height or thickness of the slab, which results in considerably less red meat per slice. Although numerous solutions have been suggested for providing classifying equipment which can produce approximately the same number of slices with varying thickness per slice, to accommodate the variations in height of the slab and produce a uniform package wherein the weight is accurately determined, there still remains hidden beneath the packaging small strips of bacon with little red meat.

Further, we are not aware that anyone has attempted, prior to the present invention, to provide a means for upgrading the bacon slabs from class B to class A to accomplish the objective of increased economic yield by upgrading, and thereby improving the sliced bacon produced for the consumer.

According to the present invention there is provided apparatus for slicing a food product slab comprising a support frame, rotary cutting means mounted on the support frame and angularly displaceable from a first position to a second position, a drive assembly coupled to the cutting means to selectively angularly position the cutting means, and means for advancing the slab into the cutting means, wherein in the first position of the cutting means a cut into the slab is perpendicular to the plane of the slab, and wherein displacement of the cutting means towards the second position provides a bias cut at an angle to the first cut.

An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a side view of slicing apparatus according to one embodiment of the invention with the cutting means (blade) in an angularly displaced position;

Figure 2 is a perspective view of the apparatus of Figure 1 showing the blade in a vertical position;

Figure 3 is a frontal view of certain portions of the apparatus of Figure 1 showing the cutting blade in the angular displaced position;

Figure 4 is also a frontal view of the

apparatus of Figure 1 in the angular displaced position with the cutting blade removed to show other features of the apparatus;

Figure 5 is a partial rearward perspective view of Figure 4 and shows additional features of the apparatus;

Figure 6 illustrates the drive means for a slab advance mechanism; and

Figure 7 is a view of the drive means taken along line 7—7 of Figure 6.

Referring now to the drawings, Figure 1, on a base frame 10 is a pivotally mounted and angularly displaceable slicer assembly 11 including a slicer blade drive means 12, a rotary slicer blade head assembly 13 and a hinged blade cover 14. A counter balance assembly 15 is fixed to the slicer assembly 11 by means 16 and coupled to a drive screw 17. A drive screw motor 18 is coupled by means 19 to the drive screw 17, and is mounted via plate 20 on base frame 10. Mounted on a base top 21 is a feed drive means 22 for feeding food slabs, for example, bacon in a continuous manner into the rotary slicing blade assembly 13. The details of the drive assembly are more particularly described in connection with Figures 5—7.

The angular displacement of slicer assembly 11 is accomplished by supplying power to leads 18', such that rotation of drive motor 18 will cause the screw 17 to turn and a screw follower mounted on the counter balance assembly 15 will cause angular displacement about the pivot point of the slicer assembly 11. The motor 18 may be an AC or DC reversible motor, with or without braking means depending on the type of jack screw utilized as a drive screw 17. Normally, the jack screw utilized will retain the position at which the motor stops without need of a brake on the motor, due to the load, and the turning on and off of the motor is sufficient to accurately position the assembly 11 to the desired angular displacement from the vertical position.

Referring now to Figure 2, the slicing apparatus is shown in the standard vertical position for perpendicularly cutting slabs of bacon, as compared to Figure 1 for cutting slabs on a bias. A rotary slicing blade 23 with blade edge 23a is positioned with respect to an edge member 24 to pass through the cutting plane of the apparatus. The minimum distance between the edge member 24 and the adjacent surface of the blade edge 23a is maintained at approximately .016" for all positions of angular displacement of the blade from the vertical position illustrated in Figure 2 to the maximum angular displaced position. The apparatus illustrated is capable of angular displacement from the vertical of Figure 2 of at least 50°. In other words, assuming a "zero" vertical position in Figure 2, the rotary slicing blade 23 may be angularly displaced forward (as shown in Figure 1) at least 50° by the arrangement of the apparatus as hereinafter described.

A slicing drive motor 25 is mounted by mounting means 26 and forms an integral part of the tiltable assembly, the motor 25 is angularly displaceable with the rotating slicing blade and drives the blade via pulley coupling means, illustrated in Figure 1, so that the blade rotates at approximately 1200 rpm. Additionally illustrated in Figure 2 is a rear wall 27 forming the back surface of the blade head assembly 13, and blade heating elements 28 which keep the blade edge relatively warm since bacon slabs are normally sliced in a semifrozen condition according to standard practices and requirements. A rotary blade cover 29 is positioned to cover the attaching elements of the blade. Pivot studs 30 form the axis about which the blade assembly is angularly displaced.

Referring now additionally to Figure 3, the apparatus of Figure 2 is shown in a frontal view with the rotary slicing blade angularly displaced forward or tilted toward the viewer. It should be noted that the blade cover 14 has been removed in both Figures 2 and 3 for simplification of the drawing. Mounted on the base frame top 21 are upstanding base frame supports 31 in which the pivot studs 30 are positioned and retained. The heating element 28 which is connected to power through a hole 37 in wall 27 has also been removed in Figure 3 for simplicity, and to illustrate the fact that it need not necessarily form part of the apparatus if it is not required because of temperature considerations of the slab to be sliced. The slicer assembly 11 contains pivot support members 32 through which the studs 30 pass through and are retained therein in a manner which permits displacement of the blade assembly 11 as illustrated. The pivot support members 32, the blade assembly rear wall 27, the slicer drive motor 25 and mounting means 26 are all movable about the studs 30, and the surface of blade edge 23a adjacent the edge member 24 is retained at a predetermined distance therefrom. Adjustment of the edge member 24 can be made by means of screws 33 which retain the edge member in the desired position by attachment to members 34 of the base frame top 21. Upstanding guides 35 are positioned and fixed to the cutting edge to retain bacon slabs in the proper lateral position within the cutting zone. A lower conveyor slab feed means 40 is positioned with the base, and U-shaped bearing mounts 36 are positioned on the

wall for a hold-down conveyor slab feed assembly which is illustrated and described in connection with subsequent figures.

Referring now to Figure 4, the figure is similar to that of Figure 3 with the exception that the cover, heating element, and the hold-down conveyor assembly are illustrated, but the rotary blade has been removed. In addition, cover 14 as shown is hinged by means 41 to upstanding wall 27. Power connecting means 42 is shown mounted to the blade wall 27 for supplying power to the heating elements. A blade shaft and mounting arrangement 43 is illustrated with the blade 23 and attachment cover 29 removed. Attached to counter balance assembly 15 is a screw follower 44 which, according to the direction of rotation of screw 17, moves in the direction indicated by arrow 45 to permit movement of the slicer assembly about the axis formed by pivot studs 30. Also illustrated in Figure 4 is the hold-down conveyor slab feed assembly 46 rotatably mounted and driven in a similar manner to conveyor feed 40, as is more specifically described in connection with Figures 5, 6 and 7. The hold-down conveyor assembly 46 comprises two parallel tracks which are rotatably mounted about a forward mounting shaft assembly 46 which is slidably mounted in the U-shaped bearing mounts 36. Attached and angularly positioned are pressure fingers 48 which retain bacon slabs firmly on the edge member 24 and between the guides 36. The forward mounting shaft assembly 47 is slidably mounted in the U-shaped bearing mounts 36 to enable movement of the conveyor assembly 46 forward with the rotating blade, so that the distance between the hold-down conveyor assembly and pressure fingers, and the rotating blade remain constant, regardless of the angular position of the blade. If some means is not permitted for movement of the hold-down conveyor assembly with the rotating blade, slippage will occur and the desired bias slicing of bacon slabs cannot be effectively controlled.

Referring now to Figure 5, a partial perspective rearward view of Figure 4 is illustrated for purposes of showing the conveyor arrangement and drive means, and together with Figures 6 and 7, illustrate a preferred means for accomplishing the feed drive for bacon slabs in all the angular displaced blade positions. The lower conveyor feed means 40 is rotatably mounted and driven about forward shaft means 48a supported in a frame 49 in base frame member 10. The lower conveyor feed means 40 comprises a multiplicity of parallel transverse cleat elements 50, rotatably mounted about drive sprockets fixedly mounted to forward shaft means 48a and rearward means not shown. In a similar manner, the two parallel tracks of the hold-down conveyor assembly 46 each have a plurality of parallel transverse cleat elements 51 rotatably mounted about drive sprockets not shown. The drive sprockets are fixedly and rotatably mounted to the forward mounting shaft 47 and rearward mounting and drive shaft 52. Illustrated in Figure 5 is an endless sprocket chain 53 on which is attached the transverse cleat elements 51. The chain 53 is engaged by sprocket wheels mounted on shafts 52 and 47. The endless sprocket chain assemblies on which the transverse cleat elements are attached are the same for both the hold-down conveyor assembly and the lower conveyor feed means. The forward mounting shaft 47 is retained and slidably mounted in U-shaped bearing mounts 36, the shaft is shown in the tilt forward position. A rigid beam member 54 and beam extension 55 supports the forward shaft member 47 and maintains the distance between the rearward drive shaft 52 and forward shaft 57 which is additionally supported by the extension 56 engaging the slotted portion of the extension 55. This rigid arrangement permits the movement of the hold-down conveyor assembly forward to the tilt forward position and rearward to the vertical position in a uniform manner.

The frame side wall guide 57 contains a cut out portion 58 permitting the slidable movement of the hold-down conveyor assembly 46 in the direction of arrows 59, while the blade assembly moves through an angular arc of at least 50° about the pivot point formed by the studs 30.

Referring now additionally to Figures 6' and 7, the feed drive arrangement in connection with the angular displacement of the rotary blade assembly will be described. A hydraulic motor 60 connected in a standard manner by input-output connections illustrated, to an hydraulic pump (not shown), is mounted by means 61 to the base frame top 21. The hydraulic motor 60 is connected by a flexible coupling 62 to a gear reduction 63 which is also mounted on base frame top 21, and which is coupled by a flexible coupling 64 to a pivot gear drive assembly 65 by a shaft 66. Shaft 66 is rotatably mounted in support bars 67, 68. Mounted on shaft 66 is a drive gear 69 and lower conveyor feed drive sprocket wheel 70. The lower drive sprocket 70 engages lower sprocket link chain 71 and drives sprocket wheel 72 mounted on shaft means 48a of the lower conveyor feed means 40. Pivot gear 73 meshes with gear 69 and is mounted on shaft 74. Mounted on shaft 74 are pivot supports 75, 76 which are pivotably mounted about shaft 66. A top plate 77

connects pivot support 75, 76, and additionally mounted on shaft 74 is a hold-down conveyor assembly drive sprocket wheel 78. Drive sprocket 78 engages a hold-down sprocket chain 79 and imparts motion to the hold-down conveyor assembly 46 through a drive sprocket wheel 80 mounted on drive shaft 52. An adjustable tension sprocket wheel 81 engages sprocket chain 79.

A yoke member 82 connects the pivot gear drive assembly 65 and the drive shaft 52 as illustrated. In addition, a tension spring 83 is coupled to the top plate 77 and a spring support arm 84 by means 85 to maintain a predetermined amount of tension, and ensure proper mesh between pivot gear 73 and drive gear 69 during all movement of the hold-down conveyor assembly 46. The pivot gear assembly arrangement enables pivot gear 73 to move about the circumference of drive gear 69 to enable the hold-down conveyor assembly 46 to be displaced in the direction of arrows 59 and adjust with the tilt of the rotary slicing blade from a vertical first position as illustrated in Figure 2 to an angularly displaced or tilt forward position as illustrated in Figures 1 and 3, while retaining the predetermined distance between the hold-down conveyor assembly and the cutting blade.

Such a slicing apparatus effectively upgrades bacon slabs since the slices of bacon produced from variable thickness slabs are uniform standard slices. Basically, this is accomplished by adjustably cutting the slabs on a bias from the front perpendicular surface such that the height and thickness of an individual slice can be maintained substantially uniform, while the thickness (height) of the slab is variable over the grade A to grade B range. The use of the present invention allows all grade A slices to be produced and effects a substantial economic return in view of the present pricing scales of the grade A and grade B bacon slabs.

WHAT WE CLAIM IS:—

1. Apparatus for slicing a food product slab comprising a support frame, rotary cutting means mounted on the support frame and angularly displaceable from a first position to a second position, a drive assembly coupled to the cutting means to selectively angularly position the cutting means, and means for advancing the slab into the cutting means, wherein the first position of the cutting means a cut into the slab is perpendicular to the plane of the slab, and wherein displacement of the cutting means towards the second position provides a bias cut at an angle to the first cut.

2. Apparatus as claimed in claim 1, wherein the cutting means is a rotatable slicer blade.

3. Apparatus as claimed in claim 2, further including an edge member mounted on the frame, and guide means mounted on the edge member through which the slab is moved forward into the path of the slicer blade.

4. Apparatus as claimed in claim 3, wherein the distance between the edge member and the cutting edge of the blade is substantially constant for at least 50 degrees of angular displacement from the first position of the blade.

5. Apparatus as claimed in any one of claims 2 to 4, wherein the slicer blade is mounted in a pivotable slicer assembly, and wherein means for rotating the blade are mounted on the slicer assembly.

6. Apparatus as claimed in claim 5, wherein the balance and drive assembly includes a counter balance assembly coupled to the slicer assembly, a motor drive means, and coupling means connecting the motor drive means to the counter balance assembly, whereby the motor drive means controls the position of the slicer assembly through positioning of the counter balance assembly.

7. Apparatus as claimed in claim 5 or 6, wherein the advancing means comprises two conveyor systems, and means for driving the conveyor systems so that the slab may be moved forward between the pair in a uniform manner into the cutting path of the blade.

8. Apparatus as claimed in claim 7 wherein the conveyor systems comprise a lower conveyor feed and a hold-down conveyor assembly.

9. Apparatus as claimed in claim 8, wherein the hold-down conveyor assembly includes a pair of tracks rotatably mounted about forward and rearward shafts, one of which is driven, and means for rigidly connecting the forward and rearward shafts.

10. Apparatus as claimed in claim 9, wherein the forward shaft is slidably mounted in the slicer assembly.

11. Apparatus as claimed in claim 10, wherein the forward shaft includes pressure finger means for applying pressure on the slab to facilitate cutting by the blade.

12. Apparatus as claimed in any one of claim 8 to 11, wherein the drive means for the two conveyor systems includes a driven pivotal gear assembly, and wherein coupling means connect the gear assembly to the lower conveyor feed and the hold-down conveyor assembly.

13. Apparatus as claimed in claim 12, further including hydraulic motor means

coupled by gear and coupling means to the pivotal gear assembly.

14. Apparatus as claimed in claim 13, wherein the pivotal gear assembly includes a driven gear and a pivotal gear movable on the circumference of the drive gear in accordance with the angular displacement of the slicer assembly.

15. Apparatus as claimed in claim 14, further including means for maintaining a predetermined tension on the pivotal gear.

16. Apparatus for slicing a food product slab substantially as herein described with reference to the accompanying drawings.

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Chartered Patent Agent,
For the Applicants.

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Fig.1.

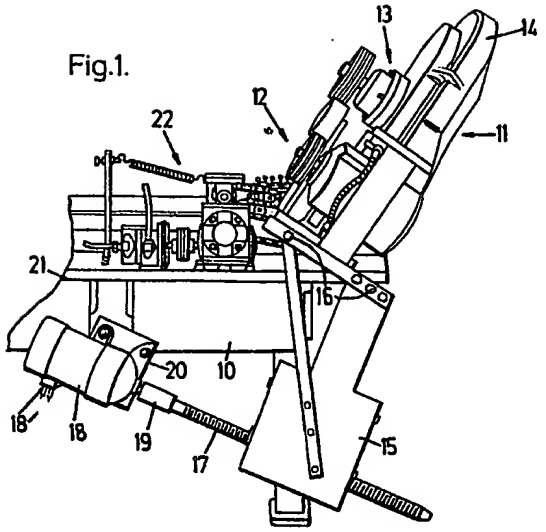

Fig. 2.

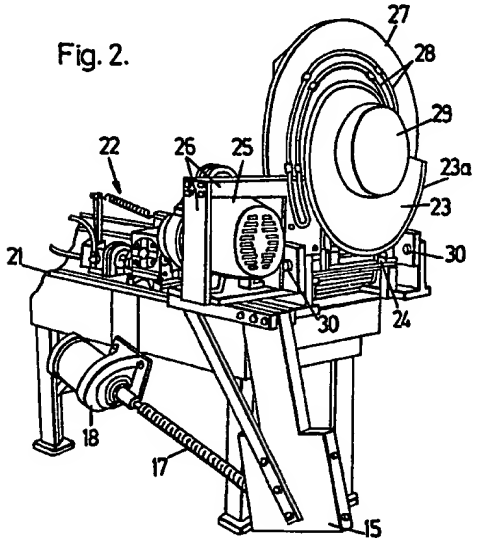

Fig.3.

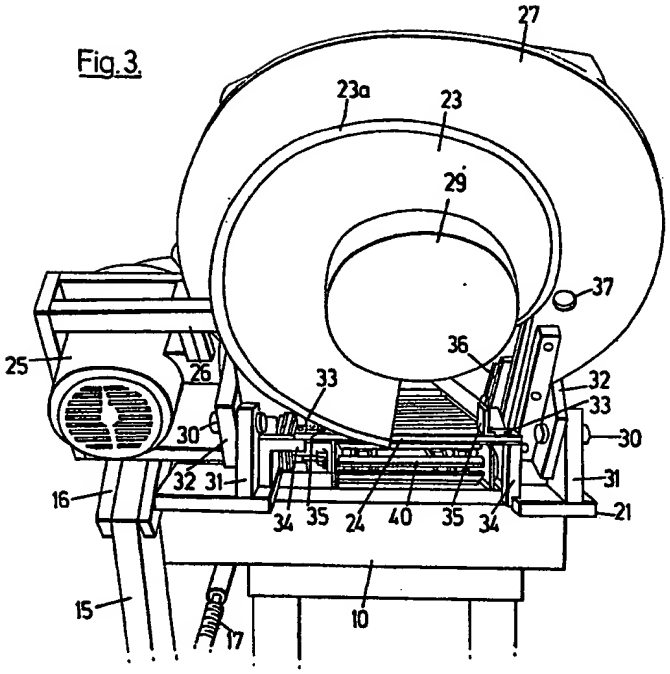
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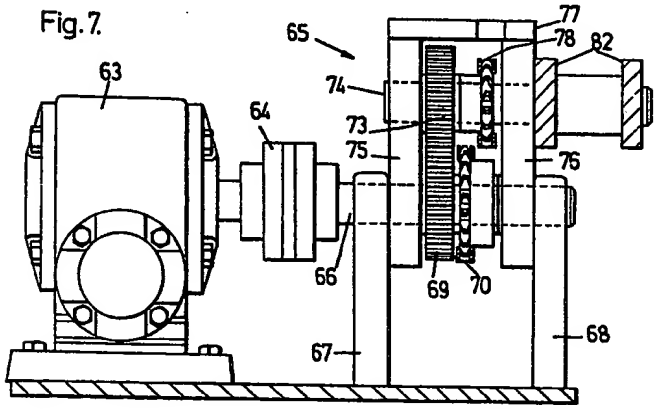
Fig.7.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Sheet 3

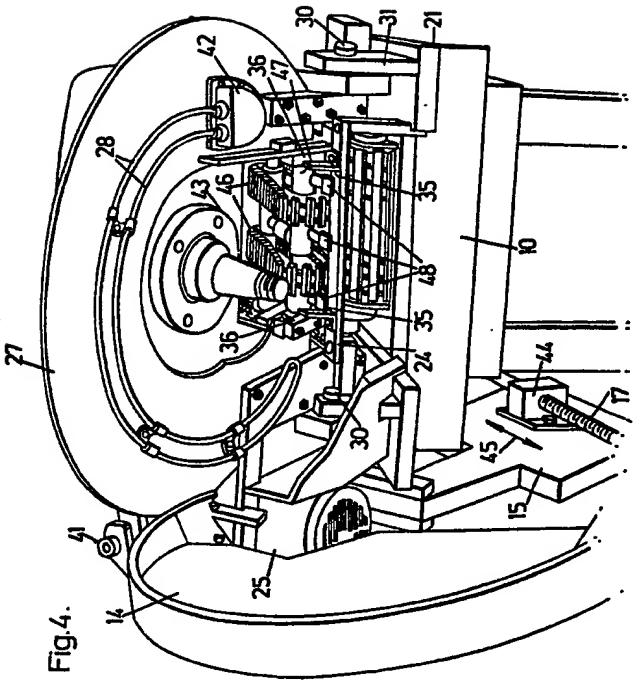

Fig.4.

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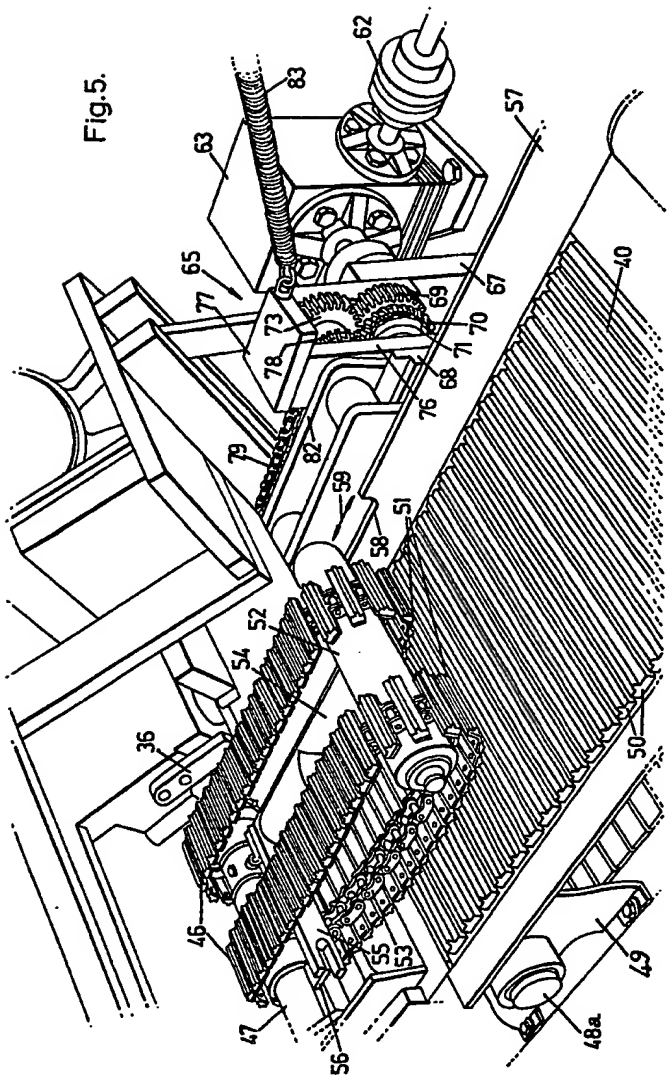
Sheet 4

Fig.5.



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Sheet 5

Fig.6.